nificantly affects Sys-Di comparison. By compensating for longitudinal motion, measurement of wall motion and plaque burden (MBA-ILA) is reduced. Studies using ICUS to analyze vessel wall compliance and morphology need to account for longitudinal catheter motion.

1013-117 Rotational Indexing of Intracoronary Ultrasound Images Using the "Peep-Hole" Technique

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Intracoronary ultrasound (ICUS) images are presented in an arbitrary rotational orientation. This can make interpretation of the anatomy difficult, particularly when serial imaging runs in a given patient have completely different orientations.

We have tested a simple technique for rotational orientation which takes advantage of side holes (SH) in a guiding catheter. Guiding catheters are opaque to ultrasound, but the SH of some guiding catheters admit the ICUS beam, resulting in a "peep hole" appearance. The position of the side holes in the image can then be used as an index of rotational orientation as the catheter is moved into the artery. In the most straightforward application, once the SH are identified the image is electronically rotated so that the top of the image is truly cephalad (toward the aortic arch). On subsequent imaging runs this same maneuver is performed so that all imaging sequences are presented in the same rotational orientation.

The "peep hole" technique can be employed with commercially available guiding catheters, but only those in which the side holes are of sufficient diameter for imaging. In vitro testing with commercially available 30 MHz ICUS catheters and a range of side hole dimensions showed that clear visualization is achieved only with side holes ≥ 1.0 mm. Feasibility tests in canine coronary arteries demonstrated a mean variability in rotational orientation during repeat imaging sequences of 7.5 degrees.

Conclusion: Preliminary testing of the "peep hole" technique demonstrates the potential of improved orientation of intravascular ultrasound images, which may allow better and more consistent interpretation of intra- and perivascular structures.

1013-118 Importance of Coronary Vessel Curvature in Determining Cross-Sectional Coronary Plaque Distribution Intravascular — Ultrasound Study

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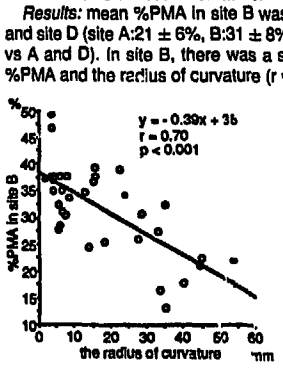
Purpose: Pathologically, it has been reported that atherosclerotic lesions are involved along the inner sites of curved arterial segments, which are sites of lower shear stress. In this study, we clarified the influence of coronary vessel curvature on a distribution of cross-sectional coronary plaque by using intravascular ultrasound (IVUS).

Method: IVUS was performed at the proximal segment of left anterior descending coronary artery (LAD) in 34 patients with stable angina. Coronary cross-sectional image was divided into 4 sites referred to the direction of circumflex coronary artery, and categorized clockwise as Site A, B, C and D. Site B was corresponded to the inside of the vessel curve and Site D to the outside. In each site, both plaque and media complex area (PMA) and %PMA (regional PMA × 100/total PMA) were calculated. We also measured the radius of curvature of the LAD proximal segment from coronary angiograms with multi-angle projections. %PMA was compared among each site, and %PMA of site B, corresponded to the inside of vessel curve, was compared with the radius of vessel curvature.

Results: mean %PMA in site B was significantly larger than that in site A and site D (site A:21 ± 6%, B:31 ± 8%*, C:28 ± 6%, D:20 ± 7%, *p < 0.001 vs A and D). In site B, there was a significant inverse correlation between %PMA and the radius of curvature (r = 0.70, p < 0.001, Figure).



Conclusion: Coronary atherosclerosis prefer to form at the inner site of the curved coronary vessels. In addition, the greater was the curvature of coronary artery, the more the atherosclerotic lesions were distributed along the inner wall of coronary artery.

1013-119 Volumetric Plaque Quantification by 3-D Intracoronary Ultrasound: Validation of Accuracy and Assessment of In-Vivo Variability

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Intracoronary ultrasound (ICUS) can directly visualize atheroma and therefore may be useful for the study of atherosclerosis progression or regression. We have previously validated an EKG-gated method for volumetric analysis of the vessel lumen. The present study utilized ultrasonic phantoms to assess the accuracy of defining atheroma volume. Irregular, cylindrical atheroma phantoms (n = 13) were constructed, imaged and analyzed using semi-automated border detection for both the lumen and external surfaces.

Results: Actual phantom volumes were determined using their specific gravity and weight (range 80–314 mm^3). The correlation between actual and ICUS-defined volumes was excellent (r = 0.90; SEE 24; ICUS = 0.94 × actual + 23.6). The mean difference was 8% ± 15%. We also assessed short term in-vivo variability. During cardiac catheterization, 28 atherosclerotic vessels had repeat ICUS exams at 5 minute intervals using the EKG-gated protocol. Plaque volume determination (30–290 mm^3) was highly reproducible (r = 0.99; SEE 7.6; ICUS 1 = 0.99 × ICUS 2 + 2.4). If this technique is to be useful for chronic followup studies, the two studies must be accurately registered. We measured the Z-axis distance between two vessel landmarks. Over a range of 8 to 38 mm, they were highly reproducible (r = 0.99; SEE 0.7; 95% CI 1.4 mm).

Conclusion: 3-D ICUS can accurately and reproducibly measure atheroma volume. This will be important for studies of coronary artery disease progression or regression.

1013-120 Angioscopic Plaque Friability: A New Risk Factor for Procedural Complications Following Saphenous Vein Graft Interventions

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Coronary angioscopy is more sensitive than angiography for detecting complex plaque morphology, intraluminal thrombus, and luminal friability. Percutaneous intervention on saphenous vein bypass grafts (SVG) is associated with increased distal embolization (DE) and no-reflow (NR). A prospective analysis on 49 consecutive patients undergoing angioscopy prior to intervention on a SVG was performed. Interventional procedures included balloon angioplasty, directional and extraction atherectomy, and stents. Angioscopic friability was defined as fragmented and loosely adherent plaque lining the vessel wall (69%), and was graded as mild, moderate, or severe. Procedural complications were DE (16%) and NR (67%), including transient NR (47%) and sustained NR (20%). The presence of laminated (73%) or globular thrombus (39%) by angioscopy did not correlate with DE or NR. In contrast, plaque friability was highly correlated with transient ($p < 0.01$) and sustained NR ($p < 0.01$), and DE ($p < 0.04$). As friability grade worsened, there was an increased incidence of sustained NR and DE ($p < 0.03$).

Friability Grade	Any NR	Sustained NR	DE
None	20%	0%	0%
Mild	54%	8%	8%
Moderate	50%	17%	33%
Severe	73%	40%	47%
Any	59%	29%	29%

Conclusions: The presence of angioscopic plaque friability (especially severe plaque friability), prior to percutaneous intervention in a saphenous vein graft is a potent predictor of no-reflow and distal embolization; absence of angioscopic friability is associated with a low risk of NR which is virtually always transient. Therefore, angioscopy is a useful adjunct for predicting complications during saphenous vein graft intervention.

1013-121 *In Vivo* Validation of Lesion Length Measurements Using Motorized Pullback of Intravascular Ultrasound Transducers

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To validate lesion length measurement using motorized intravascular ultra-